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Proceedings of the regional peer review meeting of the assessment of stock status of Atlantic herring (*Clupea harengus*) from the southern Gulf of St. Lawrence (NAFO Div. 4T)

March 6 and 7, 2012
Moncton, New Brunswick

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A regional advisory process meeting was held March 6 and 7, 2012 in Moncton (NB) to conduct a science peer review of the status of the spring spawning and fall spawning Atlantic herring (*Clupea harengus*) stocks in NAFO Division 4T, from the southern Gulf of St. Lawrence. The science review was conducted in response to a request from DFO Fisheries and Aquaculture Management (FAM) for advice regarding the status of stock and catch options for fisheries in 2012 and 2013. Participants at the science review included science staff from the DFO Gulf, Maritimes and Newfoundland regions, personnel from DFO FAM, from the fishing industry, from aboriginal communities, and from provincial governments. The stock assessment for 2010 and 2011, and catch options for 2012 and 2013 were reviewed. The stock status and catch options were summarized in a science advisory report. One supporting research document is expected in support of the science advisory report.

SOMMAIRE

Une réunion du processus consultatif régional a eu lieu à Moncton (N.-B.) les 6 et 7 mars 2012 afin d'entreprendre un examen scientifique par les pairs de l'état des stocks de géniteurs de printemps et d'automne du hareng (*Clupea harengus*) du sud du golfe du Saint-Laurent, division 4T de l'OPANO. Cet examen scientifique a été effectué dans le but de répondre à la demande d'avis formulée par la Direction de la gestion des pêches et de l'aquaculture (GPA) du ministère des Pêches et des Océans (MPO) à l'égard de l'état des stocks et des options de pêche pour les années 2012 et 2013. Le groupe de participants à cet examen scientifique était notamment composé d'employés du Secteur des sciences des régions du Golfe, des Maritimes et de Terre-Neuve-et-Labrador du MPO, de personnel du secteur de la GPA du MPO, de membres de l'industrie de la pêche, des communautés autochtones, et de représentants des gouvernements provinciaux. L'évaluation du stock pour 2010 et 2011 et les options de pêche pour 2012 et 2013 ont été passés en revue. L'état des stocks et les options de pêche sont résumés dans un avis scientifique. Un document de recherche pertinent est anticipé en vue d'appuyer cet avis.

1. INTRODUCTION

The Department of Fisheries and Oceans (DFO) conducted a regional peer review meeting on March 6 and 7, 2012 in support of a request for an assessment of the status of the spring and fall spawning components of Atlantic herring (*Clupea harengus*) of the southern Gulf of St. Lawrence, NAFO Div. 4T and for catch advice for the 2012 and 2013 fishery years. The terms of reference for the peer review meeting are provided in Appendix 1.

The meeting began at 10:00 AM, Tuesday March 6, 2012. The chair opened the meeting by welcoming the participants and reviewing the meeting room arrangements including the availability of simultaneous translation services for the meeting participants. The chair explained the process of requesting science advice, preparation of the meeting materials, the science review, and the expected outcomes. A science advisory report, a proceedings document and a research document are the expected products of the meeting.

The chair reviewed the rules of exchange for the meeting, reminding participants that the meeting was a science review and not a consultation. As well, everyone at the meeting had equal standing as participants as there was no observer status at the meeting. Table microphones were provided to ensure good communication during the meeting. Finally, the objective was to achieve consensus on the appropriateness of the assessment and catch advice and that for the purposes of the science review, consensus was taken as an absence of opposition.

The chair then invited the participants to introduce themselves; the list of participants is provided in Appendix 2.

The draft agenda was reviewed and accepted (Appendix 3).

There was one working paper to be reviewed. It was distributed by email to meeting participants on March 2, 2012.

Rapporteur duties were assigned to Alain Mallet (DFO Science Gulf Region).

The working paper was presented by Claude LeBlanc, DFO Science Gulf Region

2. CHANGES IN METHODS OR DATA SERIES FROM PREVIOUS ASSESSMENTS

2.1 Spawning group assignment

The staging criteria for assigning spawning group were reviewed. Following on analyses of samples collected from the spring 2010 seiner catches from the edge of the Laurentian Channel, it was found that spawning group assignment results based on the Gonad-Somatic-Index (GSI) formula were different from those based on macroscopic examination of the gonads. Most of the spring 2010 seiner catches classified by GSI were assigned as spring spawners, whereas the macrocospic assignment categorized them as fall spawners, the latter considered to be correct. Changes to the GSI classification formula introduced over the past decade had resulted in incorrect assignment of spawning season for herring captured in the late spring edge fishery away from inshore spawning areas. As a result, the catch at age and spawning group assignments were rerun using the revised/corrected GSI formula resulting in some changes in the catch at age matrices. The effects of

these changes on the catch at age histories were minimal, and the effect to the assessment was also considered minimal. The revised catches at age are used in this assessment.

2.2 Changes in personnel for interpreting ages

In 2010 and 2011, training and calibration of new personnel for ageing herring otoliths was undertaken. Comparisons indicate that there is both intra- and inter-ager consistency. Age interpretation is now conducted from digital images of the otoliths rather than from stereomicroscopic interpretation of the otoliths.

2.3 Change in spawner group and age weighting of acoustic abundance indices

Previously, biological samples used to determine the age composition of herring were standardized to a unit tow distance. In this assessment, the samples were weighted by the density of fish in the acoustic transect sampled. This weighting procedure corresponds to how samples from the fishery are treated, i.e weighted by landings. Samples are applied to their corresponding acoustic survey strata. In some years, some strata were not sampled and biological characteristics from the nearest sampled stratum are used. Further work of the method for assigning age and spawning group for the acoustic index was recommended. It was proposed that a check be made on the homogeneity of biological characteristics (size, spawning group, and age) within a stratum or block of strata (where multiple samples are available) and among blocks to determine if samples could be combined to estimate characteristics of unsampled blocks. The revised acoustic index was accepted for the purposes of this assessment.

3. SPRING SPAWNER ASSESSMENT

Declines in size at age were noted, even for younger aged herring which are not captured in the fishery but available from the acoustic survey sampling. Declines in size at age were also noted in other stocks of eastern Canada (Newfoundland, Bay of Fundy, Scotian-Shelf). Consequences of declining size at age on stock status are to be discussed in the uncertainties section of science advisory report.

3.1 Gillnet catch per unit effort index

Gillnet CPUE index for the spring declined in 2011. Industry participants indicated that the decline may be attributed to the reduction in the number of nets used and delays in the opening dates. The season opened on April 16 in 2011. Industry participants from fishing areas indicated herring had spawned before the fishing season opened. In previous years, landings were reported from April 20th to May 5-7 in most years but finishing later in exceptional years. No substantial landings are recorded before April 20. There was no evidence to support the hypothesis that the lower CPUE values in 2010 and 2011 were the result of the changes in opening dates. However, a run of the model without those two years was suggested and the conclusions are discussed in the next section.

3.2 Model fitting and results

A VPA model was used with gillnet CPUE indices for ages 4 to 10 and acoustic survey index for ages 4 to 8. There is a good correlation between ages for the CPUE index (tracking cohorts over time). Model fits based on mean square error (MSE) are worse now than two years ago. There is a longer term

pattern of poor fits, with the acoustic index fit being better. There is a retrospective pattern with abundance being overestimated in recent years.

A model run excluding 2010 and 2011 gillnet CPUE indices did not result in any improvements in model fit.

A model run using acoustic index only gave similar values for biomass in 2012 as model using gillnet CPUE and acoustic indices.

Spawning stock biomass is just below the limit reference points (LRP) regardless of model inputs.

The model results using all years CPUE and acoustic indices were accepted and used in projections and risk analysis. There remained a concern about the indices in the last two years. These points are influential, if excluded the stock moves to just above the LRP and when included, the stock is just below the LRP. In both cases, there is a retrospective pattern and the abundance is likely lower than estimated, although there appears to have been a slight upturn in abundance from the lows of previous years.

4. FALL SPAWNER ASSESSMENT

Fall spawner assessment is based on a VPA model with a gillnet CPUE index. The acoustic index for ages 4 to 8 has not been used because the year-class abundances do not track over years. There is a similar pattern to spring spawners of declining size at age. Recent year age-4 abundance is not estimated by the model using CPUE index only, the average abundance of the previous five years is used. Using this model, SSB in 2012 slipped below the Upper Stock Reference point.

4.1 Changes in size at age affecting the age-4 abundance index

If size at age is declining, then the catchability of age-4 herring in the gillnets may have declined as well resulting in a decline in the index unrelated to abundance. The catch data from experimental nets with smaller mesh sizes of 2 to 2.5 inches provides some evidence that the percentage of small fish is increasing somewhat in Fisherman's Bank and west PEI. To assess the importance of this on the model fits, the model was rerun excluding the CPUE age-4 index for the years 2008 to 2011. The model fits and results were similar for ages 5-10 with or without the age-4 CPUE index.

4.2 Use of acoustic index

A suggestion was made to run the model using the acoustic indices for ages 2 and 3 together with the gillnet CPUE indices for ages 4-10. The residual patterns were slightly improved and there was an improvement in the estimates of recruitment. With this model, the SSB for 2012 remained above the Upper Stock Reference. This model formulation was accepted for developing stock status and providing catch advice.

4.3 Projections

Projections of SSB for 2012 and 2013 were made using recruitment rates and abundances at age-2 based on the mean of the previous five years.

5. CONSIDERATIONS FOR FUTURE WORK

The method for assigning age and spawning group for the acoustic index should be examined in more detail, particularly as it relates to the transfer of biological characteristics from sampled blocks to unsampled blocks and whether information can be transferred more broadly than is presently done.

It was indicated that logbooks of catch and effort are mandatory for the bait fishery. These data are compiled by DFO Ecosystem and Fisheries Management but the data had not been available to DFO Science. These data should be incorporated in the assessment in the future.

Alternate model formulations that allow natural mortality (*M*) to vary over time and at age should be explored.

Models that could account for possible changes in catchability in the gillnets due to declines in size at age should be considered.

6. ADVISORY REPORT AND MEETING PRODUCTS

A draft of the advisory report was reviewed during the meeting by participants.

The working paper should be upgraded into a research document and should include the changes to models used for developing the advice.

APPENDIX 1. TERMS OF REFERENCE

Assessment of stock status of Atlantic herring (*Clupea harengus*) from the southern Gulf of St. Lawrence (NAFO Div. 4T)

Regional Peer Review – Gulf Region

March 6-7, 2012
Moncton, New Brunswick

Chairperson: Gérald Chaput (DFO Gulf Region)

Context

In support of a request for science advice from DFO Fisheries and Aquaculture Management, DFO Gulf Science Branch will review the status of the spring and fall spawning components of the Atlantic herring stock of the of the southern Gulf of St. Lawrence, NAFO Division 4T. The most recent assessment and catch advice were provided in 2010 (DFO 2010).

Objectives

Assessment of the status of the spring and fall spawning components of Atlantic herring of the southern Gulf of St. Lawrence (NAFO Div. 4T) including:

- Information on catches to the end of 2011, including best estimates of total removals by all fisheries.
- Key indicators of stock status and trends (commercial catch rates and acoustic survey, size and/or age composition, etc.).
- Available information from resource users on recent stock status relative to historical stock levels.
- Evaluation of the appropriateness and results of the population model (Sequential Population Analysis) for spring and fall components.
- Analyses of other key stock status indicators as appropriate.
- Where possible, a quantitative risk analysis of catch options relative to the probability of meeting defined management objectives for these stocks for 2012, as well as for the combined years 2012 and 2013:
    - For limit and upper stock reference points
    - For F0.1 for the fall spawning component
    - For an increase in biomass of the spring spawning component
- Projections of the number of years for the spring biomass to be above the upper stock reference point at annual catch levels of 500, 1,000 and 1,500 t.

Expected publications

- CSAS Science Advisory Report
- CSAS Proceedings report summarizing the discussions of the science review.
- CSAS Research Document(s).

Participation

- DFO Science Branch
- Other DFO Sectors
- Provinces
- External experts (to DFO)
- Fishing industry
- Aboriginal peoples

References

DFO. 2010. Assessment of Atlantic herring in the southern Gulf of St. Lawrence (NAFO Div. 4T). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/023.

APPENDIX 2. LIST OF PARTICIPANTS.

Name	Affiliation	6 March	7 March
Barlow, Trevor	PEIFA	X	X
Bourne, Christina	DFO Science Newfoundland and Labrador	X	X
Bourque, Clarence	DFO Science Gulf	X	X
Chaput, Gérald	DFO Science Gulf	X	X
Clay, Allen	Femto Electronics Limited	X	X
Egilsson, Greg	Gulf NS Herring Federation	X	X
Lanteigne, Marc	DFO Science Gulf	X	X
LeBlanc, Claude	DFO Science Gulf	X	X
Leclair, Kenneth	PEIFA	X	X
MacEachern, Leroy	DFO FAM Gulf Antigonish	X	
Mallet, Alain	DFO Science Gulf	X	X
Mallet, Pierre	DFO FAM Gulf	X	X
Melvin, Gary	DFO Science Maritimes	X	X
Mowbray, Fran	DFO Science Newfoundland and Labrador	X	X
Nicholas, Hubert	UINR		X
Power, Mike	DFO Science Maritimes	X	X
Richard, Michel	UPM	X	X
Swain, Doug	DFO Science Gulf	X	X
Tarzalt, Malika	DFO Economics Gulf	X	
Vautier, Jeffrey	Regroupement des pêcheurs professionnels du sud de la Gaspésie	X	X
Ward, Devin	North Shore Micmac Council	X	
White, Chuck	PEIFA	X	X

APPENDIX 3. MEETING AGENDA

Science Advisory Process Southern Gulf of St. Lawrence Herring (4T)

Tuesday, March 6, 2012	**Time**
Meeting room open, participants arrive and set-up for meeting	09:30 – 10:00 am
Opening remarks and review of agenda	10:00 – 10:15 am
4T herring 2010 and 2011 fishery and survey data	10:15 am – 12:00 pm
Lunch	12:00 – 1:00 pm
4T herring assessment – spring component 4T herring assessment – fall component	1:00 – 5:00 pm
Health Break	3:00 – 3:15 pm

Wednesday, March 7, 2012	**Time**
Meeting room open, participants arrive and set-up for meeting	8:15 – 8:30 am
Catch up from Tuesday (if required) Review of draft Science Advisory Report 4T Herring	8:30 am – 12:00 pm
Health Break	10:00 – 10:15 am
Lunch	12:00 – 1:00 pm
Review of draft Science Advisory Report 4T Herring	1:00 – 4:00 pm